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## CENTRAL INTELLIGENCE AGENCY

6 March 1961

INTELLIGENCE MEMORANDUM NO. 330

SUBJECT: Vulnerability of the Manganese Industry in India

1. Description of the Industry.

India has been an important contributor to US supplies of manganese ore for many years. From 1942 to 1945, US imports from India averaged 334,000 long tons per year, larger than those from any other country. India continued to rank first during the next two years, but in 1948 US imports from the USSR and from the Union of South Africa were larger than those from India. During the first 11 months of 1950, however, 583,000 long tons had been shipped from India to the US, the total for 1950 being estimated at over 600,000 tons. This amount represents a large increase over India's 1949 exports to the US of 383,000 long tons.

Location.

The principal manganese ore-producing areas of India are in Madhya Pradesh (formerly Central Provinces), Bombay, Bihar, Orissa, Sandur, Madras, and Mysore. A small amount of ore is also produced in Goa, Portuguese India. (For location of manganese deposits, see map CIA 11782.)

Madhya Pradesh is the most important of the producing areas, currently supplying 80 percent of the Indian output. The Central Provinces Manganese Ore Company (CPMD), a British-owned concern, operates 22 mines scattered throughout a belt 120 miles long by 10 miles wide, extending through Nagpur, Balaghat, and Bhandara districts. The CPMD produces 80 percent of the total manganese ore shipped from Madhya Pradesh. The balance from this area, amounting to 75,000 to 100,000 tons a year, is produced by small Indian operators. Much of their ore comes from extensions of the beds worked by the CPMD.

Mining.

Manganese deposits are generally found in hills and are mined by removing the overburden and cutting directly from the reef of manganese. In some mines the process consists of scaling off the ore, which is very brittle, from the hillside. Some blasting is done, but usually the mining proceeds satisfactorily without it. The ore is loaded by hand into small baskets that are carried on the workers' heads to the nearest tramline, dump, or sorting floor.

The management of CPMD is convinced that the mining operations should be mechanized as soon as possible, since many of the mines have reached or passed the economic limit for mining-by-hand methods. A start has been made toward small-scale mechanization, but no comprehensive program has been planned and very little machinery has been introduced. Two mines in India are reported to have underground operations. They are the Bharwelli mine, located at longitude 80° 15' E - latitude 21° 50' N, in the Balaghat district of Madhya Pradesh, and the Shivrajpur mine, located 17 miles from the Champaner Road railroad station in the State of Bombay. No information is available as to the extent of mechanization in either mine.

Transportation.

The lack of adequate transport is the greatest problem of both the large and the small manganese mine owners. Because of scarcity of railroad freight cars, there are delays in moving out ore that has been mined. In such cases, shortage of storage space and of working capital at times precludes additional mining.

Note: This report, which has been prepared at the request of the Special Assistant for Intelligence, Department of State, has not been coordinated with the intelligence organizations of the Departments of State, the Army, the Navy, and the Air Force. It contains information available to CIA as of 17 January 1961.

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The CPMD and one Indian mine owner have independent rail sidings. In other cases the transportation of ore from mine to railhead is inefficiently carried on by bullock cart or by motor truck. Gasoline is difficult to obtain. For transporting the ore from Ukva, longitude 80° 28' E - latitude 21° 58' N, in the Balaghat district, CPMD has a steam-powered steel ropeway over which buckets are drawn from the mine to the siding at Bharweli, a distance of 18 miles.

Many of the mines in Madhya Pradesh, particularly in the Balaghat district, are served only by narrow-gauge railroads. The ore must be unloaded and reloaded by hand for transfer to broad-gauge freight cars at Gondia and at Nagpur on the main line. This transshipment also makes it necessary to coordinate the flow of narrow-gauge and broad-gauge freight cars.

The section of the Bengal Nagpur railway from Nagpur to Visakhapatnam (formerly Visagapatam) with its feeder lines is the most important railroad for the movement of manganese ore, since it serves the important Madhya Pradesh area. The location of a tunnel, the more important bridges, and the transfer points along this line are shown on map CIA 11782. Another section of the Bengal Nagpur Railway serves as an outlet for the ore from northern Orissa and southern Bihar. The ore is moved over a branch line from Bara Janda to Raj Kharsawan and thence to Calcutta for export. A small amount of ore moves from Baroda through the port of Bombay and a lesser amount through the port of Lbrmgao, Portugese India.

#### Port of Visakhapatnam.

Visakhapatnam, located at longitude 83° 18' E - latitude 17° 42' N, is the chief port for manganese ore shipment. The artificial land-locked harbor, approached by a dredged channel 300 feet wide, is designed to admit ships drawing up to 28½ feet and having an over-all length of not more than 550 feet. The channel silts up and must occasionally be dredged. In the port are three quay berths, of which Nos. 1 and 2 are equipped for the handling of manganese ore. The quay berths are equipped with six 3-ton level luffing electric cranes. Three 2-foot-6-inch-gauge switching locomotives at the port are used for hauling the manganese ore from the dumps to shipside. Two of these locomotives and four cranes serve No. 1 berth, and one locomotive and two cranes serve No. 2 berth. When all of this equipment is in operation, the rate of loading at No. 1 berth approaches 2,500 tons per day, and at No. 2 berth approximately 1,000 tons. The location of port facilities especially provided for handling manganese ore are shown in the inset of Visakhapatnam on map CIA 11782 and in Figures 1, 2, and 3.

#### Loading.

Manganese is brought down in trainloads from the mines, and the cars are unloaded by hand into long stocking zones along the ore sidings behind the dock area. Dumping space for approximately 100,000 tons of manganese ore has been provided. Blending of ores from different CPMD mines is accomplished by unloading the ore trains from various mines in layers on the long piles paralleling the sidings. The ore is reclaimed for shipment by taking cross-sectional cuts from these piles, thus blending proportionate parts of ore from the various mines.

The ore is loaded on the ship by means of cars (bogies) carrying round ore buckets (Figure 2), which run on a 2-foot-6-inch track between the stockpiles and the docks. The bogies are spotted along the ore piles and are loaded by hand. The switching locomotives then transport the bogies to shipside, where the buckets are picked up from the bogies by dock cranes or ship tackle and are dumped into holds.

#### Bombay as Alternate Port.

It would be possible to move manganese ore from Madhya Pradesh westward over the Great Indian Peninsula Railway for shipment from Bombay. (See CIA map 11782 for location of tunnels and bridges along this route.) The CPMD has opposed shipment from Bombay because (1) there is a differential of five rupees per ton in the freight rate, (2) the port charges at Bombay are also higher than at Visakhapatnam, (3) there is a shortage of stocking and mixing space at the port, and (4) the rate of loading vessels is low as compared with that of Visakhapatnam, which has been developed as an ore port.

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2. Present Status of Local Measures to Protect Vulnerable Facilities.

Since manganese mining in India is primitive and the mines are widely scattered, opportunities for sabotage of mining installations are negligible. Even the mines of the CPMD, the best organized and largest producers in India, are not mechanized to a degree that would make them effective targets.

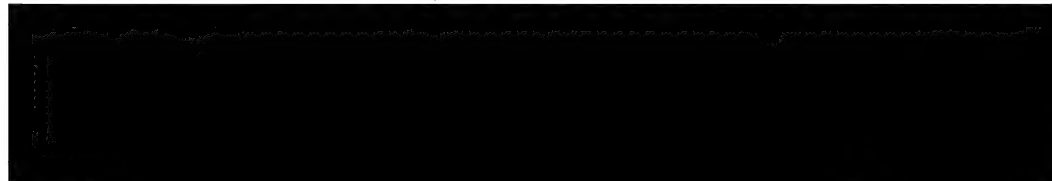
Sabotage of the important Raipur-Visakhapatnam line of the Bengal Nagpur Railway, carrying approximately 80 percent of the ore exported, could possibly interrupt shipments for a time, although the line does not move through areas where Communist influence is considered strong. If the Raipur-Visakhapatnam line were cut, shipment could continue by the alternative railway route from Madhya Pradesh to Bombay, but only after a period required to organize the new route and to equip that port to handle at least a part of the ore shipments.

The port of Visakhapatnam, which handles most of India's manganese exports and which has been equipped for this purpose, offers opportunity for sabotage. In addition, the narrow, winding channel leading to the port could be blocked. There is no indication that effective measures are being taken or even considered to guard the port's facilities. The effect of any sabotage, however, would be considerably reduced if Bombay were developed as an alternative port.

Security Comment.\*

3. a. Conclusions.

The mining installations of the manganese industry in India are not effective targets for sabotage. Although the railroad to Visakhapatnam and that port itself offer opportunities for sabotage, the availability of an alternate railroad and shipping route via Bombay could, if developed, reduce the vulnerability of transportation.



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\* This section, dealing with security, has been prepared by the CIA component responsible for security matters.

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~~SECRET~~APPENDIXMANGANESE ORES IN INDIA\*

By B. Narpati

Between the years 1913-37, Indian output of manganese ores averaged about 690,000 tons per annum. It represented more than 27 percent of world production. By percentages, other important producing regions figures as under: USSR 36 percent, Brazil nine percent, and the Gold Coast eight percent. India ranked as one of the two important producing nations of manganese ores between 1900 and 1944.

World production reached a peak of 5,968,000 tons in 1937. That year, India's share amounted to 1,052,000 tons. Production during 1937 in the USSR amounted to 2,709,000, Union of South Africa 621,000 tons, Gold Coast 527,000 tons, and Brazil 258,000 tons.

World production in 1944 registered the lowest point since 1934. India dropped to fourth place in that year. It produced 13 percent of the world output.

As a producer of high-grade manganese ores, India rose to third place during 1946-47. Its share of world production was only nine percent. In the immediate postwar years, production in the USSR was 46 percent of world output, and that of the Gold Coast 18 percent.

India as United States supplier: India has been an important supplier of manganese ores to the United States for many years. India accounted for about 13 percent of total US imports during 1913-37. Other sources of supply averaged 41 percent for Brazil and 25 percent for the USSR.

Imports of manganese ores into the United States during the prewar years 1937-39 averaged 674,000 tons per year. Of these, India accounted for 62,000, USSR 228,000, the Gold Coast 208,000, Cuba 120,000 and Brazil 50,000.

Receipts from India averaged 334,000 tons per year during the period 1942-45. These were larger than those from any other country. India maintained the first place during the next two years. But imports, both from the USSR and the Union of South Africa, were larger than those from India. Receipts from India declined by about 50 percent between 1947 and 1948. Those from the U.S.R increased by about 29 percent.

India's position as supplier of manganese ores containing 35 percent or more manganese to the United States during 1937-48 was eight percent of the total in 1937, as compared to 40 percent in 1943, and 17 percent in 1948.

List of the manganese ores exported from India to the United States are of metallurgical grade. Exports from India to this source in 1948 included 189,062 tons of metallurgical grade ores valued at \$3,217,824 and 1,525 tons of battery and chemical grade ores valued at \$36,215.

Ore Analysis: In general, the manganese ore produced in India is of very high grade. The manganese content averages from 47 to 52 percent.

Indian ores are in general of higher grade than those received from other countries. But they have a relatively high iron content. It is usually necessary to blend them with ores from other sources. Nevertheless, they are fairly hard, lumpy in structure, and reduce readily in the furnace. They blend well with other ores, and high-grade ores are usually low in silica.

Production and Exports: Manganese ore deposits have been worked to a small extent since time immemorial by Indians. These have been used in the manufacture of cosmetics and ceramics, and in the hardening of ferrous-metal products.

The first occurrence of manganese ore in India is an account given in 1829 of such ores having been found in the crystalline limestone of the Nagpur District, Central Provinces. It was not until 1891 that any deposits were worked. Vizagapatam (Madras) was the only area producing ore up to 1899. A syndicate was formed in the same year to operate in several districts of the Central Provinces.

\* This article on the Manganese ore industry of India was published in December 1950 in the Madras Liberator and gives a good picture of the industry. The article has been used as a source for this report.

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Operations were started in 1904 in Jhabua State (Central India), the Singbham district (Bengal), and the Belgau district (Bombay). Operations in the deposits of the Shimoga district (Mysore) date back to the years 1904-5.

India's exports of manganese ores have not followed a consistent pattern during the past twelve years. During 1937-39, nearly 17 percent of the shipments were destined for the United States. United Kingdom accounted for 31 percent, Japan 21 percent, and France 15 percent. Quantities shipped to Belgium, Italy, and Germany were small. During the period 1942-45 about 83 percent of the exports were to the United States, and 16 percent to the United Kingdom.

In the immediate postwar period (1946-47), approximately 76 percent was shipped to the United States. The United Kingdom accounted for seven percent. Shipments to Europe were resumed. Fifty-six percent of India's manganese ore exports during 1948 were to the United States. The United Kingdom accounted for 21 percent, Italy 9 percent, and Japan 7 percent. Shipments to the United States were about 40 percent less than during 1947. Those to the United Kingdom increased by 38 percent.

**Ore Reserves:** The "Report of the Provincial Industries Committee of the Central Provinces and Berar", which was published in 1945, included the following recommendation:

"At the prewar rate of extraction the known reserves will not last more than 30 years. No further expansion of manganese mining is therefore desirable. On the contrary, there would seem to be every justification for slowing down the present rate of exploitation considerably after the war in view of our rapidly dwindling resources."

The Report also said that the "reserves of higher grade ore about 48 percent manganese were estimated in 1943 to be only 10 to 20 million tons."

The estimation of known reserves in the report is considered a very serious understatement by mine owners. Authoritative refutation of the above claim would have to come from a competent geologist.

**Mining in the Central Provinces:** The principal manganese ore producing areas in India are the Central Provinces, Madras, Bombay, Bihar, Orissa, Sandar, and Mysore. A small tonnage of manganese ore is produced in Goa, Portuguese India.

The Central Provinces ranks first as the largest producer of manganese ore in India. Of the total Indian output of 18,289,000 tons during the period 1913-38, 71 percent was mined in this province.

Production in the C.P. is dominated by the Central Provinces Manganese Ore Co. (CPMD). It is a British-owned firm with head offices in London. This company accounts for 80 percent of the provinces' present production of about 500,000 tons per annum. It owns mines at 18 different places in Nagpur, Balaghat, and Bhandara Districts.

The reasons for this dominance are several. The CPMD holds long-term leases for the best of the known manganese producing properties. These include the Ukwa mine taken over from Carnegie Steel in the early 1930's. "Its ores are relatively high in manganese content and low in phosphorous, iron, and silica."

The CPMD markets its ores as a mixture. It is considered highly desirable by the steel industries in the UK and the United States. A secondary reason for the dominance of this company is that it is controlled by experienced British mining engineers.

In addition to the CPMD mines, there are some 45 Indian-owned mines in the Central Provinces. The total annual production of these has been currently estimated at 72,300 long tons. The annual production potential for the Indian-owned mines under more favourable circumstances is estimated at 100,000 tons.

**Marketing:** There is a difference between the marketing methods of CPMD and those of the Indian mine owners. The CPMD deals direct with large end-users of manganese, both in the United States and in the United Kingdom. Indian mine workers, on the other hand, sell to agents of British and European companies in

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India. An agent, a Belgian company, has been associated with the Indian manganese industry for many years.

Labour: Indian manganese mine owners are unable to keep labour continuously employed. The mining of manganese in India is primarily a hand operation. Payment for labour is very low.

The CPID pays its labourers on a piecework basis. The payment is  $1\frac{1}{2}$  rupees or  $1\frac{1}{4}$  rupees per ton of manganese--depending on which part of the mine it is taken from--and about one rupee per ton of stone and earth.

Transportation: The greatest single problem of both large and small manganese mine owners is the lack of adequate transportation.

Government controls: The Government of India is currently exerting directional control over exports and collecting an export duty. The Provincial Government levies either a royalty of 5 percent on the total sales from the mines or a dead rent of 25 rupees, whichever is higher, per acre of the mining area. It is applicable to leases granted since 1937. The dead rent was only five rupees per acre prior to 1937. The owner has to pay the Provincial Government even if the mines are not worked.

The rate of royalty for long-term leases, which run for about 30 years, is only  $2\frac{1}{3}$  percent. Indian mine owners have been able to negotiate only five-year renewals.

In addition to these royalties and dead rents, the Provincial Government also levies a sales tax of half an anna on the rupee on all sales effected by the owners.

Summary: "India's lack of dollar exchange indicates that the expansion of manganese shipments to the United States would work to the benefit of both countries."

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